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(54) A device for cooling and condensing the steam released from the washing drum of a dishwasher machine and the like

(57) A device for the condensation and cooling of the steam released from the washing drum of dishwasher machines and the like comprising a storage chamber (28) for a cooling water connected via a tapping nozzle (30) to a water feed pipe (33) for filling the washing drum of the dishwasher and a steam cooling and condensing chamber (36) connected via a steam release aperture (26) to the washing drum of the dishwasher machine and open above to release the steam cooled therein. Said steam cooling and condensing chamber (36) having at least one wall or portion of wall for contact with the cooling water inside the chamber (28) for an heat exchange between said cooling water and the steam in order to decrease the steam temperature. Preferably as cooling water it is used the water stored for the regeneration phase of the resins which decalcify the water utilized in the dishwasher machine.

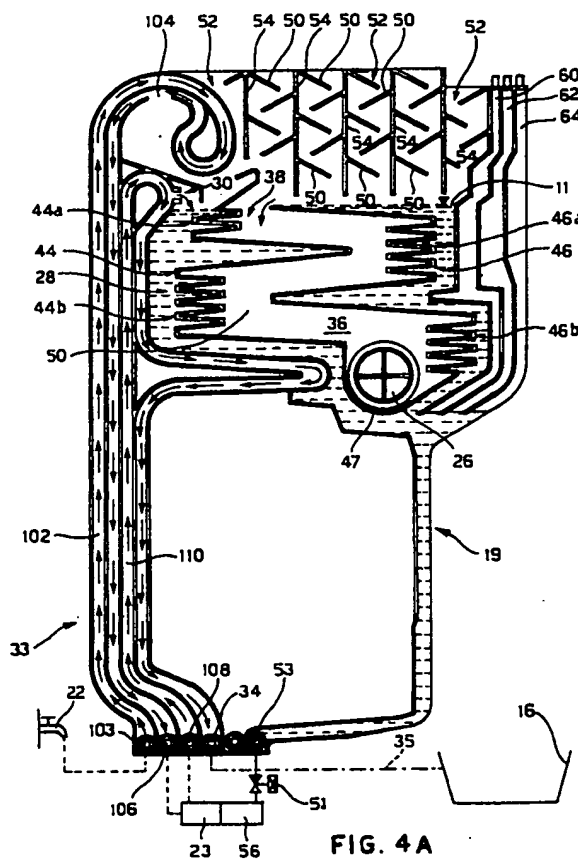


FIG. 4A

## Description

The present invention relates to a device for the condensation of the steam released from the washing drum of dishwasher machines and the like.

The release devices of the type referred above are produced in order to eliminate the excess steam which is formed in the washing drum during the phases of washing, hot rinsing and drying of the dishes.

This fact is particularly felt in the drying phase during which a considerable amount of steam is formed in the washing drum of the dishwasher, due to the residual heat of the dishes, as well as that caused by the resistor used for heating the washing and rinsing water. These excess pressures, caused by the formation of steam during the phases of washing, hot rinsing and drying, or possibly also following sudden opening and immediate closure of the door of the dishwasher machine during heating of the water, or by the actual movements of water in the washing drum, particularly caused by the start-up of the washing pump, may trigger the safety devices of the dishwasher which are used to control the level of water in the washing drum of the latter, blocking operation of the dishwasher, all this without any hazardous level in the drum of the dishwasher having been reached.

The traditional steam release devices comprise a circular aperture for feeding "hot" steam in the release device which is coupled to a corresponding circular aperture formed in the lateral wall of the washing drum, and an outlet pipe which extends upwards where the steam is emitted, still hot, outwards, via an appropriate discharge port. In these traditional devices an excessive release of steam occurs inside the dishwasher which damages the furniture and accessories of the areas where the dishwashers are installed.

With the use of these traditional devices, the process of cooling and condensing the steam is somewhat slow so that the outflow of steam from the washing drum of the dishwasher occurs with difficulty and the pressure inside the drum remains somewhat high.

Dishwashers are also known which have a tank for containing and storing water intended for regeneration of the decalcification resins, said regeneration water tank being filled via a nozzle which taps water coming from the water supply system and which has not been decalcified beforehand.

In traditional condensation devices no contact is provided between the release conduit and the drum for the regeneration water.

The object of the present invention is that of providing a device for the condensation of steam released from the washing drum of dishwasher machines and the like which allows the quantity of hot steam emitted from the dishwasher to be reduced.

Another object of the present invention is that of providing a device of the type referred above which allows a rapid outflow of the steam from the washing drum and fast lowering of the value of the pressure

formed in the washing drum, so that any risk of intervention of the latter is avoided.

Yet another object of the present invention is that of providing a device of the type referred above which has a compact configuration, with little bulk, and such as to occupy a small volume inside the dishwasher.

The previous objects are achieved with a device having the features of claim 1, that is to say a device for the cooling and condensation of steam released from the washing drum of a dishwasher machine and the like, said steam being produced into said washing drum of the dishwasher machine during a working operation of the dishwasher machine and having a determinate temperature; characterized in that it comprises a chamber for storing a cooling water having containing walls, a chamber for condensing and cooling the steam having containing walls, a steam inlet aperture for connection with the inside of the washing drum of the dishwasher machine and being open above for emitting said steam outside of the condensing and cooling chamber, said chamber for condensing and cooling the steam having at least one wall or portion of wall in common with at least one wall or portion of wall of said chamber for the cooling water in order to permit an heat exchange between the steam and the cooling water so that said steam can condense and/or decrease in temperature before going outside of the condensing and cooling chamber.

Thanks to these innovative features, due to the contact of the hot steam with the walls of the cooling chamber which are in contact with cold water, said released steam is force-cooled and condensed and returns to the drum, thus remaining inside the dishwasher. The environment outside the dishwasher is not excessively humidified and the objects and furniture housed in the same area as the dishwasher are not damaged in any way by this humidity.

The fact of condensing steam in output also accelerates to a certain extent the emission of steam from the washing drum, compared to similar traditional devices, causing a faster drop of the steam pressure inside the washing drum and prevention of risks of triggering of the safety devices.

Moreover, the fact of using regeneration water for cooling the steam allows the latter to be heated so that heated water is fed into the regeneration resins tank which makes the ion exchange of regeneration of the resins more efficient.

The present invention will be made clearer on reading the following description, relating to a preferred embodiment of the present invention, to be read with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a dishwasher;

Figure 2 is a perspective view showing the washing drum housing the device of the present invention;

Figure 3 is a perspective view of the block housing the device of the present invention;

Figure 4A is a sectioned view taken along line 4A-4A of Figure 3;

Figure 4B is a partially sectioned view, taken along line 4B-4B of Figure 3;

Figure 5 is a sectioned view of a detail of the cooling chamber for the released steam of the present invention.

Figure 1 shows, denoted by reference numeral 10, a traditional dishwasher comprising at least one external framework 12 having a front door 14 for closing an aperture 15 via which the dishes are placed in the washing drum 16.

With reference also to Figure 2, it can be seen that said washing drum 16 has a sump 18 and a lower aperture 20 for feeding salt for regenerating the resins in a suitable tank 56 formed in the same box 21 which houses the resins container 23.

The device of the present invention, as shown in Figure 1, is situated in a block 19, together with other devices not shown or described, which is housed between the lateral wall of the washing drum 16 and the opposite wall of the chassis or shell 12 covering the dishwasher.

The feed water of the dishwasher is taken from the water supply system via an appropriate tap 22 or the like.

At drying, at the end of the washing cycle, due to the residual heat of the dishes created at the end of the last hot rinse, the water remaining on the surface of the dishes is evaporated, leading to the formation of a considerable quantity of steam in the washing drum. Said steam is emitted from the side hole 24 of the drum and enters the condensation device of the present invention via the corresponding aperture provided in the wall of said block 19. The two holes are generally tightly connected one to the other by means of a ring nut and a rubber sealing ring, but this fact has not been expressly shown in the figures.

With reference also to the subsequent figures, it can be seen how the device for condensation of the steam released from the washing drum of the present invention essentially comprises a chamber for storing the regeneration water 28 connected via a tapping nozzle 30 to the water feed pipe which fills the washing drum of the dishwasher and wholly designated by the numeric reference 33. As shown in Figure 4A said water feed pipe flows into an outlet 34 and said water, via appropriate piping 35, is conveyed to the washing drum 16. The device of the present invention also comprises a steam cooling and condensing chamber 36 communicating via said steam release aperture 26 with the washing drum 16 of the dishwasher machine and an upper aperture 38 for the release of cooled steam at a

height level lower than said tapping nozzle 30.

As shown particularly in Figure 3, said steam cooling chamber 36 has, as shown in Figures 4A and 4B, a first and a second head wall 40, 42 turned towards the washing drum and towards the exterior of the dishwasher respectively, and a first and second lateral wall 44, 46 and a back wall 47 which are in contact with the water which is inside the container for the regeneration water 28. This allows, as already mentioned, considerable heat to be taken from the released steam so as to encourage condensation thereof. In this way hot steam is no longer emitted to the exterior of the dishwasher or at least this emission of steam is very limited and, thanks to the condensation of the steam in the cooling chamber, a pressure drop is achieved downstream of the washing drum which facilitates expulsion of the excess steam from the washing drum itself. Hot regeneration water is also obtained which accelerates the process of ion exchange for regeneration of the resins.

Additionally, the fact of arranging said cooling chamber in the centre of the regeneration water chamber provides a system which occupies a small volume inside the block 19.

According to the preferred embodiment shown, the lateral walls 44, 46 of the cooling chamber have a corrugated profile such as to increase the surface of contact with the regeneration water and hence the steam cooling capacity of the system.

Moreover in portions 44a, 44b and 46a, 46b said lateral corrugated walls 44, 46 have respectively a serrated trend which further increases the surface of said walls in contact with the cold regeneration water.

Again to encourage transfer of heat from the hot released steam, at least part of the head wall 42 turned towards the exterior of the dishwasher has been made with teeth 48 which enable it too to increase the surface of the cooling chamber designed to disperse heat, in this case no longer in contact with the regeneration water but instead in contact with the air on the external side of the dishwasher.

The section of the steam cooling chamber is shown in detail in Figure 5. It indicates moreover that the head wall 40 turned towards the drum of the dishwasher is totally flat.

The steam condensation device of the present invention also has a system for collecting the drips in the steam emitted from the cooling chamber 36 through the aperture 38. Said condensed steam collection system situated above the aperture 38 of said cooling chamber 36 consists of a plurality of fins 50 slanting downwards through approximately 45° and at whose lower ends the drips of condensation of the released steam are formed.

The surplus steam not collected on the fins, in an advantageously cooled state, is emitted from the upper apertures 52 of the block 19.

According to the preferred embodiment shown, said fins 50 for collecting the condensed drips of steam released from the washing drum of the dishwasher extend laterally from vertical support portions or rods 54

attached laterally to the head walls of the block 19.

A further advantageous feature of the present invention consists in the fact that said cooling chamber for the released steam has said upper aperture 38 for release of the steam which is wetted by the regeneration water on two opposite lateral edges. When the level of regeneration water has reached the maximum level M, there is an overflow of the same regeneration water in the cooling chamber 36 and from the latter to the washing drum through the release aperture 26. In this way at least the internal faces of the walls of the cooling chamber are wetted with the cold regeneration water and thus an even more efficient cooling of the hot released steam is achieved. The regeneration water which percolates inside the cooling chamber, flowing along the corrugated profiles of the internal faces of the lateral walls of the latter, in any case wets also in part, if not all, the internal faces of the head walls 40, 42 of the cooling chamber.

In the figures 60, 62 and 64 denote chambers for containing additional quantities of regeneration water.

During regeneration of the resins, the control timer of the dishwasher machine commands opening of the gate of the solenoid valve 51 which allows the regeneration water to flow through the outlet 53 to the salt container 56 and from there to the resins container 23, where it regenerates the same resins or takes the calcium ions withheld by the latter thanks to an ion exchange between the sodium ions of the salt solubilised in said regeneration water following the flow of the latter in contact with the salt and calcium ions attached to the resins.

According to a further advantageous feature of the present invention water is used for regeneration which has already been decalcified, and all this with the dual purpose of using for regeneration water which, being totally lacking in calcium ions, facilitates the ion exchange for regeneration of the resins, that is to say the removal of said calcium ions from the decalcification resins.

This fact entails the further advantage that, when the water in the chamber 28 exceeds the level M and is conveyed to the washing drum of the dishwasher, water free from calcium ions, which therefore does not interfere with the washing process, is fed into the washing drum.

For this purpose, according to the preferred embodiment shown here, the pipe 33 for feeding the water taken from the supply system by means of the tap 22 also comprises a first section 102, in which the mains water enters via the outlet 103, comprising an air break 104 which conveys the "hard" mains water through the outlet 106 to the resins tank 23. The decalcified water flowing from the resins tank 23 enters, via an outlet 108, a portion 110 of the water feed pipe from which it flows out via the outlet 34 and then reaches the washing drum 16 of the dishwasher.

According to the preferred embodiment shown here, said tapping nozzle 30 for filling the tank for the

regeneration water is provided on the part of the water feed pipe 110 for filling the washing drum which is downstream of the tank for the decalcification resins.

The block 19 containing the device of the present invention is preferably manufactured in a polymeric material by sealing with a hot blade two detached and matching parts, one of which has the projections defining the channels and lateral walls of the basins or chambers of the device. Such a manufacturing method is in any case wholly traditional.

It is naturally understood that what has been written and shown in reference to the preferred embodiment of the present invention has been given purely as a non-limiting example of the principle claimed.

## Claims

1. A device for the cooling and condensation of steam released from the washing drum of a dishwasher machine and the like, said steam being produced into said washing drum (16) of the dishwasher machine during a working operation of the dishwasher machine and having a determinate temperature; characterized in that it comprises a chamber (28) for storing a cooling water having containing walls, a chamber (36) for condensing and cooling the steam having containing walls, a steam inlet aperture (26) for connection with the inside of the washing drum (16) of the dishwasher machine and being open above for emitting said steam outside of the condensing and cooling chamber (36), said chamber (36) for condensing and cooling the steam having at least one wall or portion of wall (44,46) in common with at least one wall or portion of wall (44,46) of said chamber (28) for the cooling water in order to permit an heat exchange between the steam and the cooling water so that said steam can condense and/or decrease in temperature before going outside of the condensing and cooling chamber (36).
2. A device according to claim 1, characterized in that said chamber (28) for the cooling water is the chamber for containing the regeneration water of the dishwasher machine.
3. A device according to claim 2, characterized in that said chamber (28) for storing regeneration water is connected, via a tapping nozzle (30) to a water feed pipe (33) for filling the washing drum (16) of the dishwasher and in that a tapping nozzle (34) for filling the tank (23) for the regeneration water is provided on the part of the water feed pipe (33) for filling the washing drum (16) which is positioned downstream of the tank (23) for the decalcification resins so that for regeneration of the decalcification resins only decalcified water is used.
4. A device according to claim 1, characterized in that

said chamber (36) for cooling and condensing steam has an upper aperture (38) whose lateral edges are wetted by the cooling water into said chamber (28) so that said cooling water can wet internally part of the walls of the cooling and condensing chamber (36). 5

5. A device according to claim 1, characterized in that above said cooling and condensing chamber (36) a plurality of fins (50) are arranged for the condensation and collection of the steam. 10
6. A device according to any of previous claims, characterized in that said steam cooling and condensing chamber (36) has a first and a second head wall (40, 42) turned towards the washing drum (16) and towards the exterior of the dishwasher respectively, as well as a back wall (47) and a first and a second lateral wall (44, 46) in common with the chamber (28) for the cooling water and in contact with the cooling water. 15 20
7. A device according to claim 6, characterized in that at least one of the lateral walls (44, 46) of the steam cooling and condensing chamber (36) in contact with the cooling water have a corrugated profile such as to increase the surface of contact with the cooling water. 25
8. A device according to claim 7, characterized in that portions (44a, 44b; 46a, 46b) of the lateral corrugated walls (44, 46) of the cooling and condensing chamber (36) have a serrated profile. 30
9. A device according to claim 6, characterized in that the head wall (42) of said cooling and condensing chamber (36) turned towards the exterior of the dishwasher has at least part (48) of its profile which is cogged, to increase the heat dispersion outwards. 35 40
10. A device according to any of previous claims, characterized in that of being realized in a unitary block (19) in polymeric material. 45

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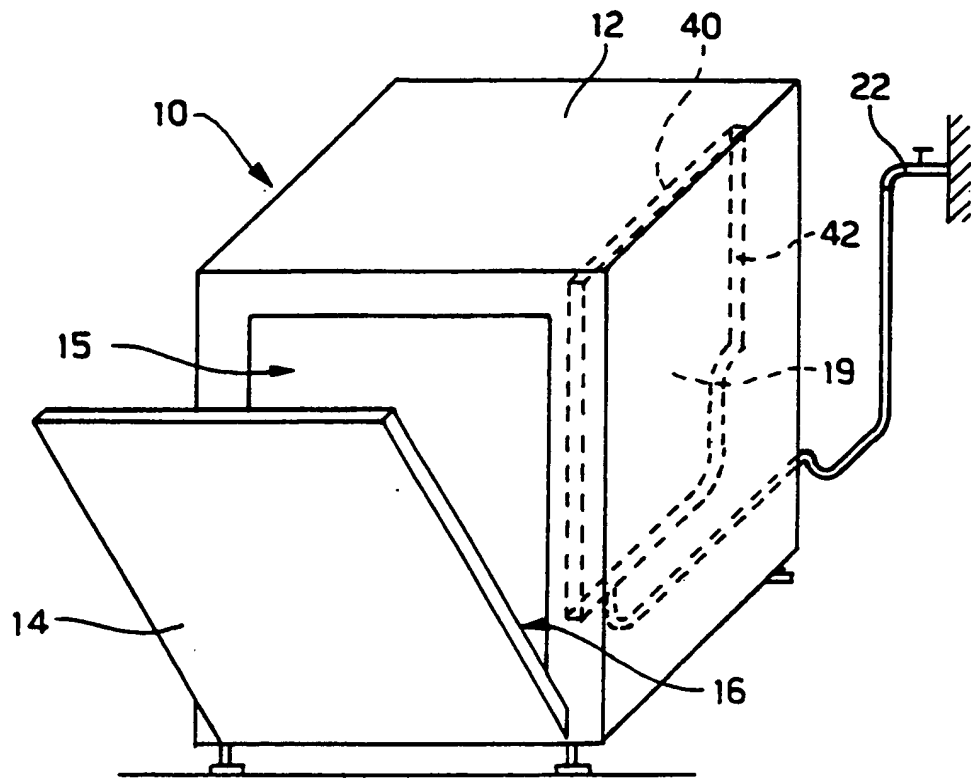


FIG. 1

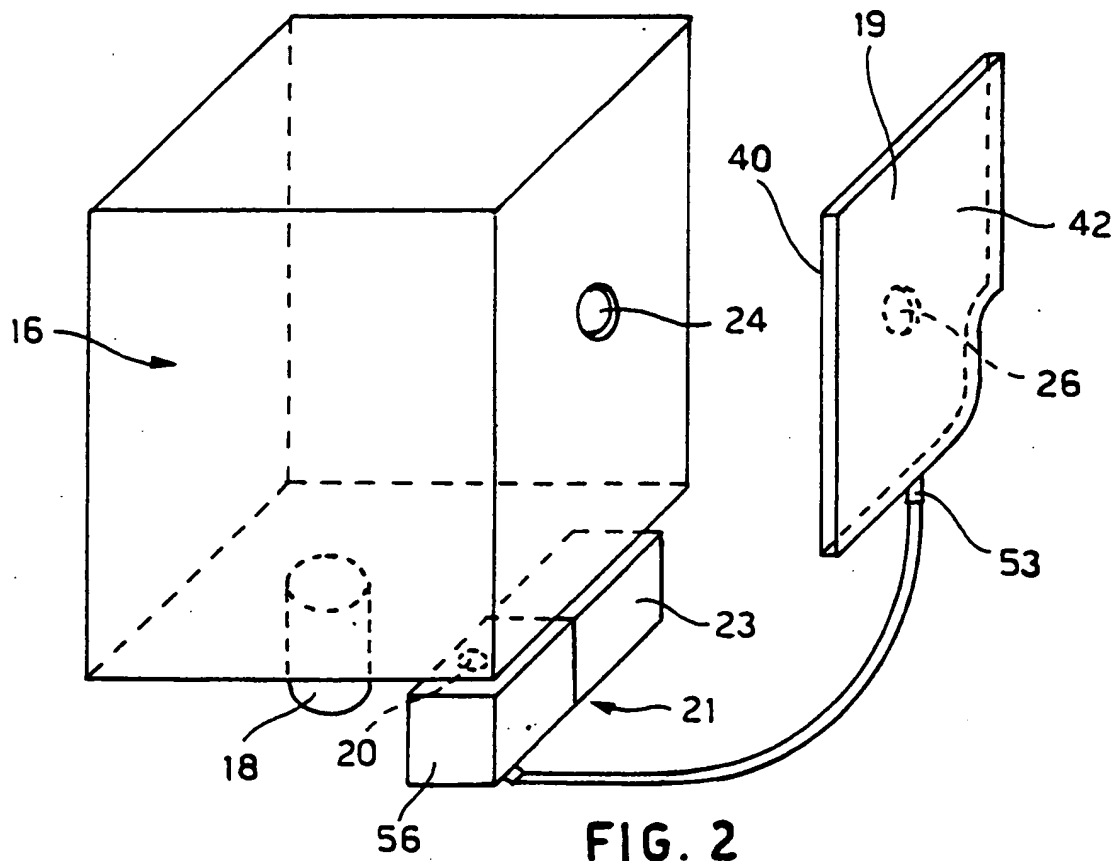


FIG. 2

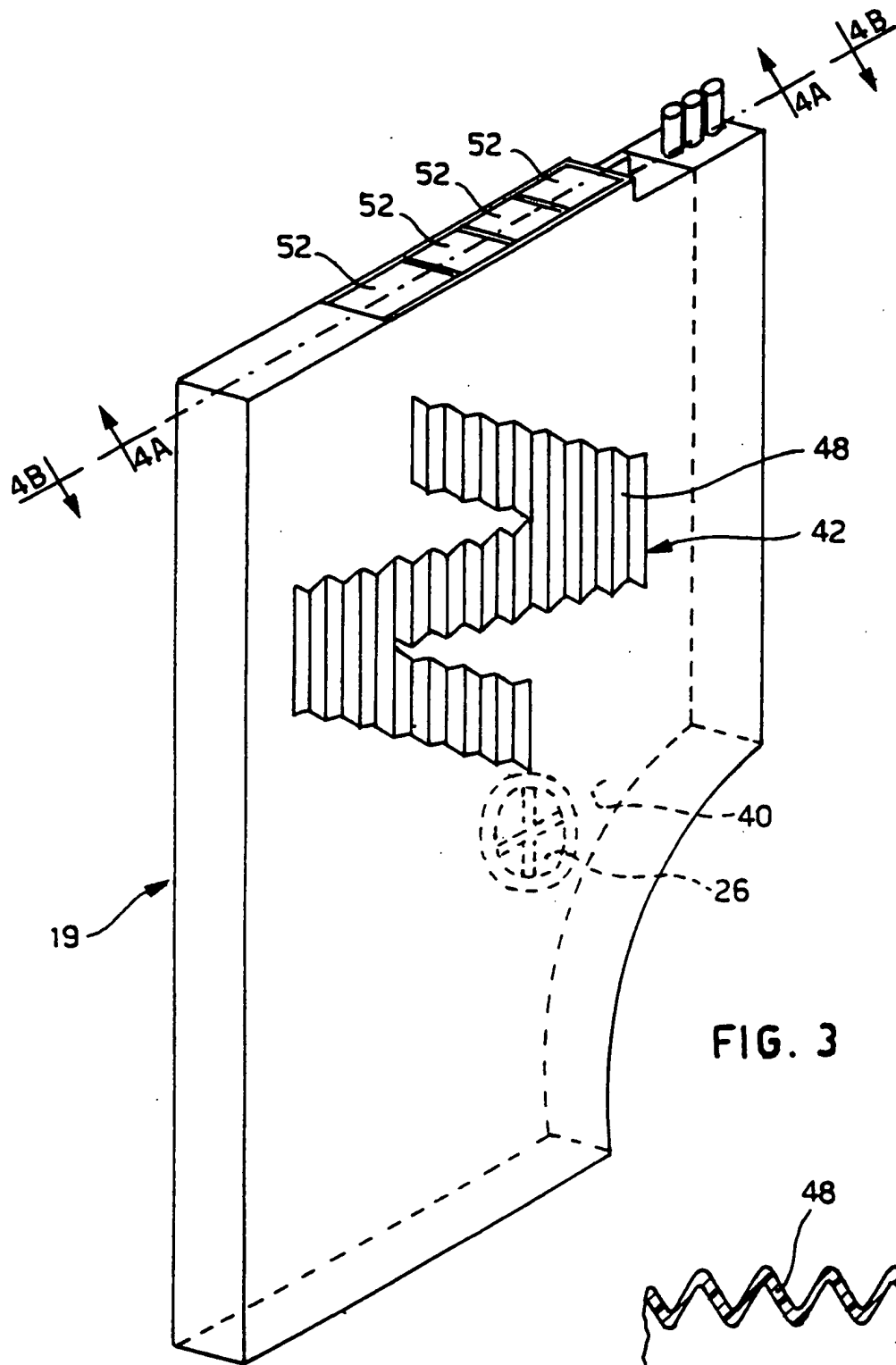


FIG. 3

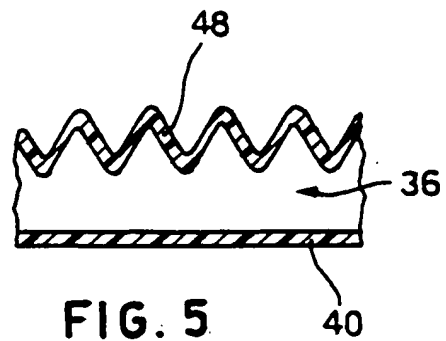


FIG. 5

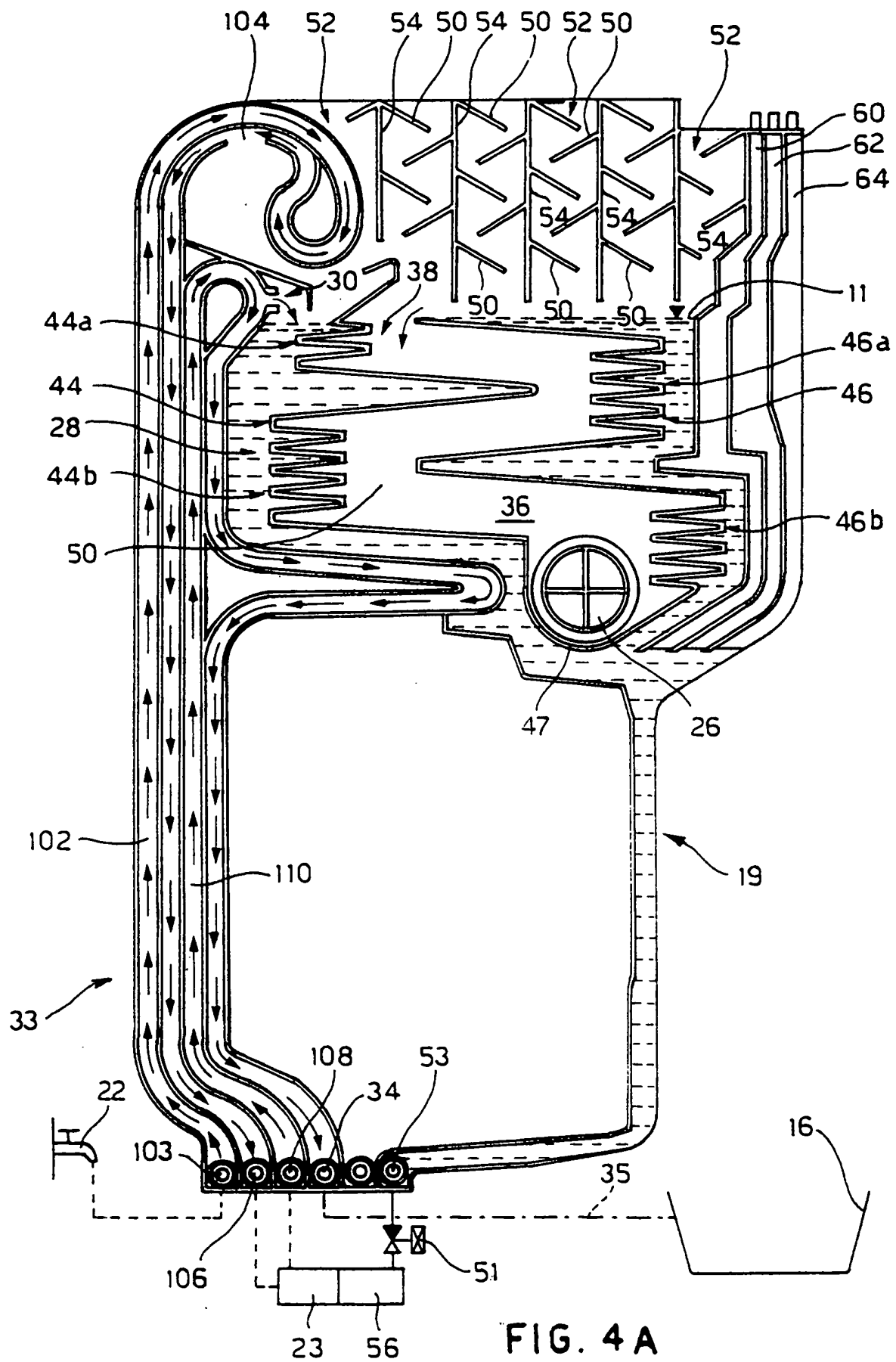
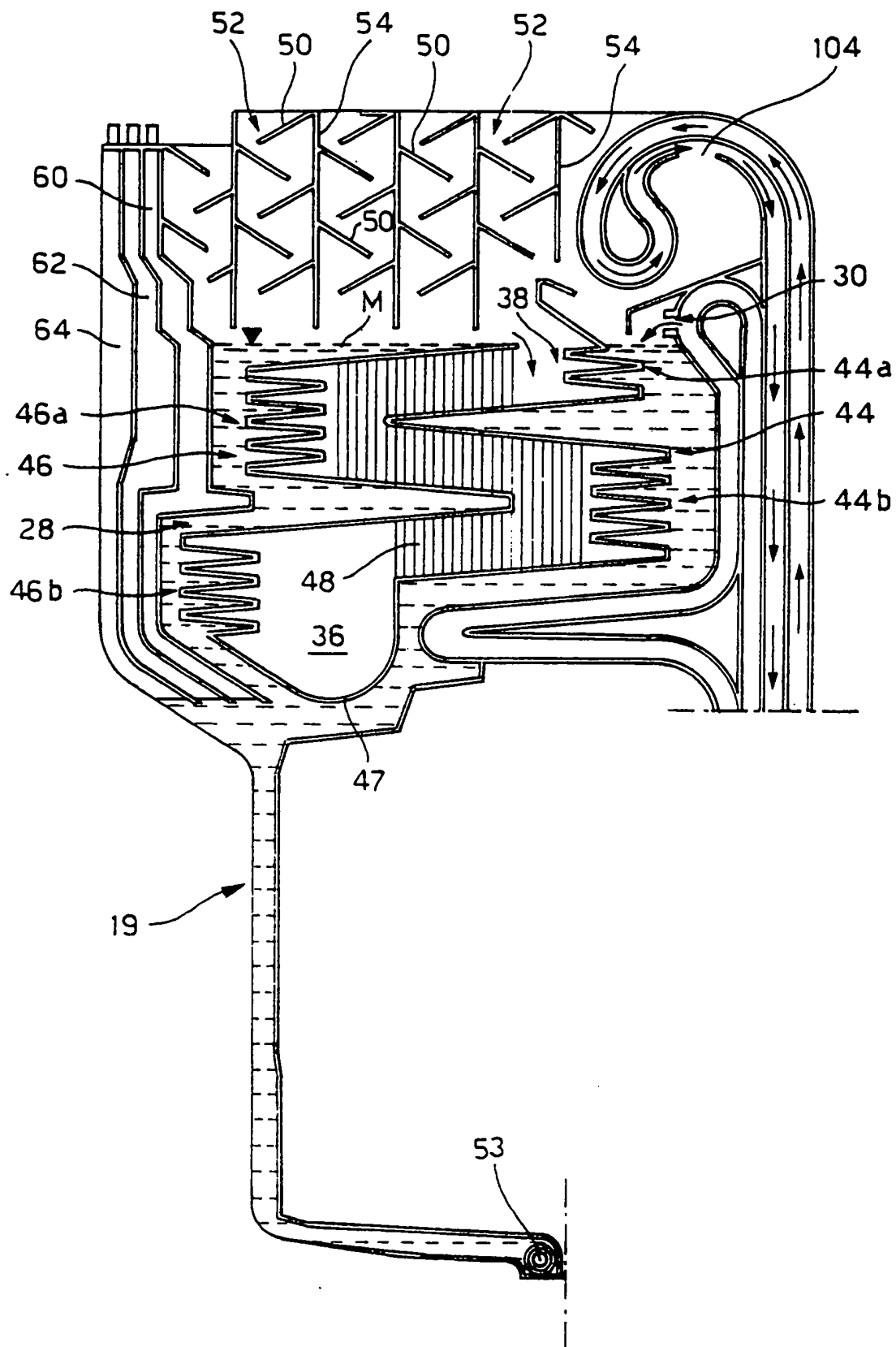


FIG. 4A







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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 11 0968

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP-A-0 486 828 (BOSCH-SIEMENS HAUSGERÄTE GMBH)	1	A47L15/48
A	* the whole document * ---	2,3	
Y	EP-A-0 463 576 (ZANUSSI ELETTRODOMESTICI S.P.A.)	1	
A	* column 3, line 21 - line 45; figures * -----	4,5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A47L D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		15 October 1996	Courrier, G
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  .....  &amp; : member of the same patent family, corresponding document</p>			